Sudan University of Science and Technology

College of Graduate Studies

Some Applications of Forms and Vector Calculus

بعض تطبيقات الصيغ و حسبان المتجهات

A Thesis Submitted in partial Fulfillment for the Requirements of the M.Sc Degree in Mathematics

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Dedication

To my father , mother

,wife

and all my family member

To someone who has a lot in my Deep down…

Acknowlededements

I would like to express my special thanks to:-

Dr.Emad Aldeen Abdallh Abdel Rahim

To my family ,To my friend and who help me

Abstract

In this research we study the abstract vector spaces, we apply the language of forms to electromagnetism in a subsequent volume .We Also discuss the generalization of the fundamental theorem of calculus to higher dimension. We present the generalized of Stokes theorem with some applications.

الخلاصة

في هذا البحث درسنا فضاءات المتجه المجردة ، و طبقنا لغة الصيغ للكهرومغنطيسية في الحجم المتتالي . ايضا ناقشنا تعميم المبرهنة الاساسية للحسبان للبعد الأعلى، و قدمنا تعميم لمبرهنة ستوكس مع بعض التطبيقات . .

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The contents

Introduction

In this research we consider the importance of surfaces as a language to study the theoretical and applied scince. We discuss the differential forms and vector calculus, and organized our study as follows:-

In chapter (1) we discuss the parallelograms and their volumes. We study the parametriztions, arc length, surface area, and volume of manifold, with some examples and application.

In chapter (2) we study the forms as integrands over oriented domains, and forms on IR^n . We also discuss integrating form fields over parametrized domains, and forms and vector calculus, with some examples.

In chapter (3) we present orientation and integration of form fields, and we discuss boundary orientation. We also illustrate the concept of the exterior derivative, and we explain the methods of taking the exterior derivative twice, with some examples.

In chapter (4) we present the exterior derivative in the language of vector calculus. We discuss geometric interpretation of the exterior derivative in IR^n, and the generalized Stoke's theorem. We also study the integral theorem of vector calculus, and potentials, with some examples and application